

*Ct
Sulfur*

a device configured to collect at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas; and
a device configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash;
wherein the arrangement includes a NOx collector.

REMARKS

I. Introduction

Claims 14 to 16, 19 to 20 are currently pending in the present application. Claims 17, 18 and 21 to 25 have been canceled without prejudice. In view of the foregoing amendments and the following remarks, it is respectfully submitted that all of the presently pending claims are allowable, and reconsideration is respectfully requested.

II. Rejection of Claims 14 to 16, 19, 20 and 22 to 25 Under 35 U.S.C. § 102(b)

Claims 14 to 16, 19, 20 and 22 to 25 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,850,735 ("Araki et al."). Claims 22 to 25 have been canceled thus rendering the rejection of these claims moot. Applicants respectfully submit that Araki et al. do not anticipate claims 14 to 16, 19 and 20 for the following reasons.

Independent claim 14 relates to an emission control system. Claim 14 recites that the emission control system includes a particle filter and an arrangement disposed upstream from the particle filter and configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state. Claim 14 further recites that the arrangement includes a device configured to collect at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas and a device configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash. Claim 14 has been amended to recite that the arrangement includes a NOx collector, which was cited in originally-filed claim 18, now canceled.

Araki et al. purport to relate to a method for purifying exhaust gas of an internal combustion engine. Abstract. Araki et al. state that a diesel particulate filter ("DPF") 93 is used to filter soot (carbon particles) in the exhaust gas and also as a sulfate absorbent. See col. 15, lines 34 to 38. The DPF 93 is stated to have porous walls, which collect the soot, and numerous internal gas passages coated with alumina, silica or titania, which absorb sulfate. See col. 15, lines 52 to 59. Nowhere do Araki et al. disclose, or even suggest, an arrangement disposed upstream from the particle filter and that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in independent claim 14. Given that the DPF 93 is stated to include porous filter walls coated with a sulfate absorbent, i.e., have an integrated filter and sulfate absorbent, it is respectfully submitted that Araki et al. do not disclose an arrangement, as recited in claim 14, disposed upstream from the particle filter. Further, the Office Action admits that Araki et al. do not disclose that the arrangement includes a NO_x collector, as recited in amended claim 14. See Office Action at p. 4.

The Final Office Action's Response to Arguments, made in response to Applicants' arguments presented in the Amendment filed on April 3, 2003, reveal critical flaws in the Office's understanding of Araki et al. See Final Office Action at pp. 5 to 7. The Final Office Action generally alleges that over a long period of time SO₃ and SO₄ on the washcoat surface decreases a cross-sectional flow of the filter or DPF 93, which results in clogging of the filter or DPF 93. The Final Office Action further generally alleges that Araki et al. operate a regeneration cycle to purge the DPF 93 of the collected SO₃ and SO₄. Applicants respectfully disagree. The Final Office Action seems to indicate that it is the SO₃ and SO₄ that is directly responsible for the clogging of the DPF 93. However, Araki et al. state that it is the soot, not the SO₃ and SO₄, that clogs the DPF 93. See col. 16, line 5. The temperature of the exhaust gas is stated to be increased when necessary to release the absorbed SO_x (independent of whether the DPF 93 is clogged) or when necessary to burn the soot in the DPF 93. See col. 15, line 66 to col. 16, line 5.

The Final Office Action further generally alleges that the oxidation catalyst 91 prevents clogging of the DPF 93 by converting collected SO₃ and SO₄ to gaseous SO₂ which can flow through the DPF 93. However, the Final Office Action

completely ignores the sulfate that combines with other elements downstream of the oxidation catalyst 91 to form filter clogging ash, such as CaSO_4 , ZNSO_4 , MgSO_4 , CaO , FeO , etc., which is not absorbed by the sulfate absorbent. In contrast, the present invention involves pulling the sulfate out of the exhaust gas before it reaches the particle filter. If this is not done the sulfates interact with other elements before reaching the particle filter and form ash which clogs the filter, which clogging is not eliminated by removing SO_x from the sulfate absorbent.

The Final Office Action specifically alleges that DPF 93 may be considered "a device (coating layers of alumina on the surface wall of the exhaust gas passages of the filter(93)) configured to collect at least a portion of the ash-forming compounds of sulfur in the exhaust gas (during a lean operation of the engine, SO_x in the exhaust gas is oxidized by the device to form ash-forming compounds (SO_3 and SO_4) of sulfur", as recited in claim 14. Final Office Action at p. 3. However, the Final Office Action completely ignores the requirement that the "device" is recited in claim 14 as being upstream of the filter. As indicated above, given the fact that the DPF 93 of Araki et-al..is stated to include porous filter walls coated with a sulfate absorbent, the sulfate absorbent of Araki et al. DPF 93 is not and could not be upstream of the filter or DPF 93. Nor do Araki et al. disclose, or even suggest, a separate sulfate absorbent upstream of the DPF 93. Therefore, Araki et al. do not disclose all of the structural limitations of claim 14.

The Final Office Action further specifically alleges that the oxidation catalyst 91 may be considered "a device (91) configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash (the oxidation catalyst (91) oxidizes the rich components in the exhaust gas so that the oxygen level in the exhaust gas is reduced and the temperature of the exhaust gas is raised to a level sufficiently high to maximize the transformation of the collected (SO_3 and SO_4) into gaseous compounds (SO_2) of Sulfur (also see the Abstract))." Final Office Action at p. 3. Applicants respectfully traverse the Final Office Action's allegation that an oxidation catalyst converts ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash and respectfully submit that nowhere do Araki et al. disclose, or even suggest, a device configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash, as recited in claim 14. As stated in the present application at page 2, lines 17 to 23 of the Specification:

The exhaust coming from the engine contains sulfur compounds, e.g., 98% SO₂, 2% SO₃ and Ca, Fe, Mg, Zn and P. At temperatures above 350°C, sulfate forms in oxidation catalyst 1, where SO₂ and SO₃ are converted into SO₄. Ash, such as CaSO₄, ZNSO₄, MgSO₄, CaO, FeO, etc., develops downstream from oxidation catalyst 1. This ash collects in particle filter 2 and clogs it. (emphasis added).

It is respectfully requested pursuant to 37 C.F.R. § 1.104(d)(2) that the Examiner provide an affidavit and/or that the Examiner provide published information concerning these assertions. This is because this rejection is apparently being based on assertions that draw on facts within the personal knowledge of the Examiner, since no support was provided for these otherwise conclusory and unsupported assertions. (See also M.P.E.P. § 2144.03).

To anticipate a claim, each and every element as set forth in the claim must be found in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of Calif., 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). Furthermore, “[t]he identical invention must be shown in as complete detail as is contained in the . . . claim.” Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). That is, the prior art must describe the elements arranged as required by the claims. In re Bond, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). As more fully set forth above, it is respectfully submitted that Araki et al. do not disclose, or even suggest, an arrangement, including a NOx collector, disposed upstream from the particle filter and that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in claim 14. It is further submitted that Araki et al. do not disclose, or even suggest, a device, disposed upstream of the particle filter, configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash, as recited in claim 14. It is therefore respectfully submitted that Araki et al. do not anticipate claim 14.

As for claims 15, 16, 19 and 20, which ultimately depend from claim 14 and therefore include all the limitations of claim 14, it is respectfully submitted that Araki et al. do not anticipate these dependent claims for at least the same reasons given above in support of the patentability of claim 14.

III. **Rejection of Claims 17, 18 and 21 Under 35 U.S.C. §103(a)**

Claims 17, 18 and 21 were rejected under 35 U.S.C. § 103(a) as unpatentable over Araki et al. in view of U.S. Patent No. 6,233,927 ("Hirota et al.").

Claims 17, 18 and 21 have been canceled herein without prejudice, thereby rendering the present rejection moot. Given Applicants' incorporation of the limitations of claim 18 into claim 14, Applicants further submit that the combination of Araki et al. and Hirota et al. does not render obvious claim 14 for the following reasons.

The Final Office Action states that, with respect to claims 17 and 18, "the system of Araki et al. discloses the inventions as cited above," Office Action at p. 4, but admits that "[Araki et al.] fail to disclose that the arrangement further includes an NO_x collector." However, the Final Office Action contends that "[a]s shown in Figure 1, Hirota et al. teach an exhaust gas purification device comprising a particle filter (7) that also absorbs SO_x in the exhaust gas and a NO_x collector (11) to purify harmful NO_x emissions in the exhaust gas." Final Office Action at p. 4. The Final Office Action asserts that "[i]t would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the NO_x collector taught by Hirota et al. in the system of Araki et al., since the use thereof would have reduced the emission of harmful NO_x gas into the atmosphere." Final Office Action at pp. 4 to 5. The Final Office Action further alleges, with respect to claim 21, that "in the modified emission control system of Araki et al., the arrangement includes an oxidation catalyst (91)." Final Office Action at p. 5.

Hirota et al. purport to describe an exhaust gas purification device including a trapping element arranged in the exhaust passage upstream of the NO_x absorbent for trapping particulates and a processing element for processing the particulates trapped in the trapping element to regenerate the trapping element. Abstract. Therefore, the NOx absorbent is downstream of the processing element or filter. Hirota et al. further state that the gas purification device includes a preventing element for preventing the exhaust gas from flowing into the NOx absorbent from the trapping element. Abstract. Accordingly, nowhere do Hirota et al. disclose, or even suggest, an arrangement, including a NOx collector, disposed upstream from a particle filter that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or

maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in claim 14.

To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Since the combination of Araki et al. and Hirota et al. does not disclose, or even suggest, all of the limitations of amended claim 14 as more fully set forth above, it is respectfully submitted that the combination of Araki et al. and Hirota et al. does not render obvious amended claim 14.

IV. Conclusion

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached pages are captioned "**Version with Markings to Show Changes Made.**"

It is therefore respectfully submitted that the presently pending claims are allowable. All issues raised by the Examiner having been addressed, an early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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Version with Markings to Show Changes Made

IN THE CLAIMS:

Claims 17, 18 and 21 to 25 have been canceled without prejudice.

Claim 14 has been amended without prejudice as follows:

14. (Twice Amended) An emission control system, comprising:

a particle filter; and

an arrangement disposed upstream from the particle filter and configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by one of transformation and maintenance of at least one of the compounds responsible for ash formation in the gaseous state, the arrangement including:

a device configured to collect at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas; and

a device configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash;
wherein the arrangement includes a NOx collector.